

MILITARY SPECIFICATION SHEET  
 ELECTRON TUBE, NEGATIVE GRID (MICROWAVE)

TYPE 2C40A

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The complete requirements for procuring the electron tube described herein shall consist of this document and the latest issue of Specification MIL-E-1.

DESCRIPTION: Planar triode, metal-glass  
 See figure 1  
 Mounting position: Any  
 Weight: 1.2 ounces (34 grams) nominal

ABSOLUTE RATINGS:

CW OSCILLATOR:

Parameter:	F	Ef	Eb	Ib	Ehk	Ik	Pp	tk	T(seal)	Ec	Ic
Unit:	MHz	V	V	mAdc	V	mAdc	W	sec	°C	Vdc	mAdc
Maximum:	3,370	6.6	500	25	+90	33	6.5	---	200	-50	8.0
Minimum:	---	6.0	---	---	---	---	---	60	---	---	---

ANODE PULSED OSCILLATOR:

Parameter:	F	Ef	eb	ec	Ehk	Ib	ib	Ic	ic	Pp	tp	Du	T(seal)
Unit:	MHz	V	v	v	V	mAdc	a	mAdc	a	W	μs	--	°C
Maximum:	3,370	6.6	1,400	-100	+90	3.0	2.0	1.5	1.0	4.0	1.5	0.002	200
Minimum:	---	6.0	---	---	---	---	---	---	---	---	---	---	---

TEST CONDITIONS:

Parameter:	Ef	Eb	Ck	Rk	tk
Unit:	V	V	μF	Ohms	sec
	6.3	250	1,000	200	300

GENERAL:

Qualification - Required  
 Holding period (MIL-STD-1311) t = 168 hours  
 --- See note 1

(E) denotes changes

2C40A  
 FSC 5960

METHOD	REQUIREMENT OR TEST	CONDITIONS	AQL (PERCENT DEFECTIVE)	INSPECTION LEVEL OR CODE	SYMBOL	LIMITS		UNIT
						Min	Max	
	<u>Quality conformance inspection, part 1</u>							
1231	Pulse emission	prf = 500; tp = 2.0 us; (eb=ec)/is = 2.5 a	0.65	II	etd	---	190	v
1266	Total grid current		0.65	II	Ic	---	-0.5	μA <sub>dc</sub>
1236	Power oscillation (pulsed)	Rk = Rg = 0; eb = 1,400 v; tp = 1.0 μs +10%; prf = 1,000 +10%; Du = 0.001 +10%; F = 3,000 MHz (min); ib = 1.5 a (max); t = 30 sec (min); see notes 2, 3 and Dwg 209-JAN	0.65	II	Po starting voltage	200	---	mW
1306	Transconductance		0.65	II	Sm	4,400	5,700	μmhos
1256	Electrode current (anode)		0.65	II	Ib	12	21	mA <sub>dc</sub>
	<u>Quality conformance inspection, part 2</u>							
1211	Insulation of electrodes	E(g to all)=-100Vdc E(sh to all)=-500Vdc	---	---	R	100	---	Meg
1301	Heater current		---	---	If	700	800	mA <sub>dc</sub>
1261	Electrode voltage (cutoff) (grid)	Ec/Ib = 10 μA <sub>dc</sub>	---	---	Eco	---	-26	Vdc
1336	Heater-cathode leakage		---	---	Ihk	---	50	μA <sub>dc</sub>
1236	Power oscillation (cw)	Eb = 250 Vdc (max); Ib = 25 mA <sub>dc</sub> (max); Rg = 10,000 ohms; Rk = 0; F = 3,370 +100 MHz; t = 30 sec (min) Dwg 102-JAN	---	---	Po	35	---	mW
1331	Direct-interelectrode capacitance	No voltages DESC Dwg 65025	---	---	Cgp Cin Cout Cksh	1.20 2.00 ----- 50	1.40 2.45 0.030 200	pF pF pF pF
1231	Emission	(Eb=Ec)/Is= 40 mA <sub>dc</sub>	---	---	Etd	---	8	Vdc
1316	Amplification factor		---	---	Mu	27	44	---

METHOD	REQUIREMENT OR TEST	CONDITIONS	AQL (PERCENT DEFECTIVE)	INSPECTION LEVEL OR CODE	SYMBOL	LIMITS		UNIT
						Min	Max	
	<u>Quality conformance inspection, part 3</u>							
----	Life-test (1)	Group A Eb = 300 Vdc; Rk/Ib = 17 mAdc; t = 500 hours	---	---	---	---	---	---
----	Life-test (1) end point:							
1236	Power oscillation (cw)		---	---	Po	25	---	mW
----	Life-test (2)	Group C; power oscillation (pulsed) except prf = 2,000 +10%; t = 500 hours	---	---	---	---	---	---
----	Life-test (2) end point	Life-test (2) conditions	---	---	Po	300	---	mW
Ⓔ 1031	High-frequency vibration	F = 50 Hz; 10G; Ebb = 300 Vdc; Rp = 10,000 ohms; Ec/Ib = 10 mAdc; Notes 4, 5 and 7	---	---	Ep	---	100	mV
Ⓔ 1101	Secureness of base, cap, or insert	No voltages; torque to be applied between anode and pins without shock Notes 4 and 7	---	---	---	20	---	lb-in.
Ⓔ ----	Torque-test end point							
1266	Total grid current	Note 7	---	---	Ic	---	-0.5	Adc
Ⓔ ----	Frequency drift	Notes 4, 6 and 7	---	---	F	---	2.0	MHz

NOTES:

1. The following test methods shall not apply: Methods 1006 and 1201.
2. The pulse shape shall be in accordance with method 1296. Minimum power output limit, based on a duty factor of 0.001, may be adjusted for the exact duty factor used. Coupling and tuning to be adjusted for maximum power output. The tube shall operate under the given conditions and minimum output, or greater, for a minimum of 30 seconds without arcing or instability as evidenced by pronounced variations in the average anode current meter or the power output meter. If temporary arcing does occur during the 30-second period, the tube must subsequently operate for 60 seconds without arcing. The test may be discontinued, at the end of the 30-second period, if the power output has not completely stabilized but is rising. If the power output is falling, the test is continued until a stable reading is obtained. For qualification approval, a stable reading shall be obtained.
3. The starting voltage is measured by raising the pulsed anode voltage from zero and noting the voltage at which a readable indication is obtained on the power meter. The tube may not be oscillating during the full width of the modulation pulse during this test.
4. Test 10 tubes selected at random from the first production lot of each calendar year, and approximately every 90 days of production during the year. If more than one tube fails to pass the specified end point, the failed test shall become a part of quality conformance inspection, part 2, on all lots in process. After three consecutive successful submissions, the test shall revert to the 10-tube quarterly test.
5. Vibrate in direction perpendicular to plane of grid.
6. Frequency drift.
  - (a) Set for conditions of power oscillation (cw).
  - (b) Reduce Ef to 6.0 volts and allow frequency to stabilize. Record frequency.
  - (c) Raise Ef to 6.6 volts and allow frequency to stabilize. Record frequency.
  - (d) Reduce Ef to 6.0 volts and allow frequency to stabilize. Record frequency.
  - (e) Readings (b) and (d) shall not differ by more than 0.3 MHz. If a greater difference is found, repeat (a) through (c) inclusive.
  - (f) Frequency drift is equal to the difference between the frequency recorded at (b) and (c), or (c) and (d), whichever is greater.
  - (g) During the frequency drift test, there shall be no evidence of abrupt change in the power output meter. If such a change does occur, the oscillator shall be returned for a more stable operation.
7. This test shall be performed during the initial production and once each succeeding 12-calendar months in which there is production. A regular double sampling plan shall be used, with the first sample of three tubes with an acceptance number of zero, and a second sample of three tubes with a combined acceptance number of one. In the event of failure, the test will be made as a part of quality conformance inspection, part 2, code level D, with an AQL of 6.5. The regular "12-calendar month" double sampling plan shall be reinstated after three consecutive samples have been accepted.

## Custodians:

Army - EL  
Navy - EC  
Air Force - 85

Preparing activity:  
Air Force - 85

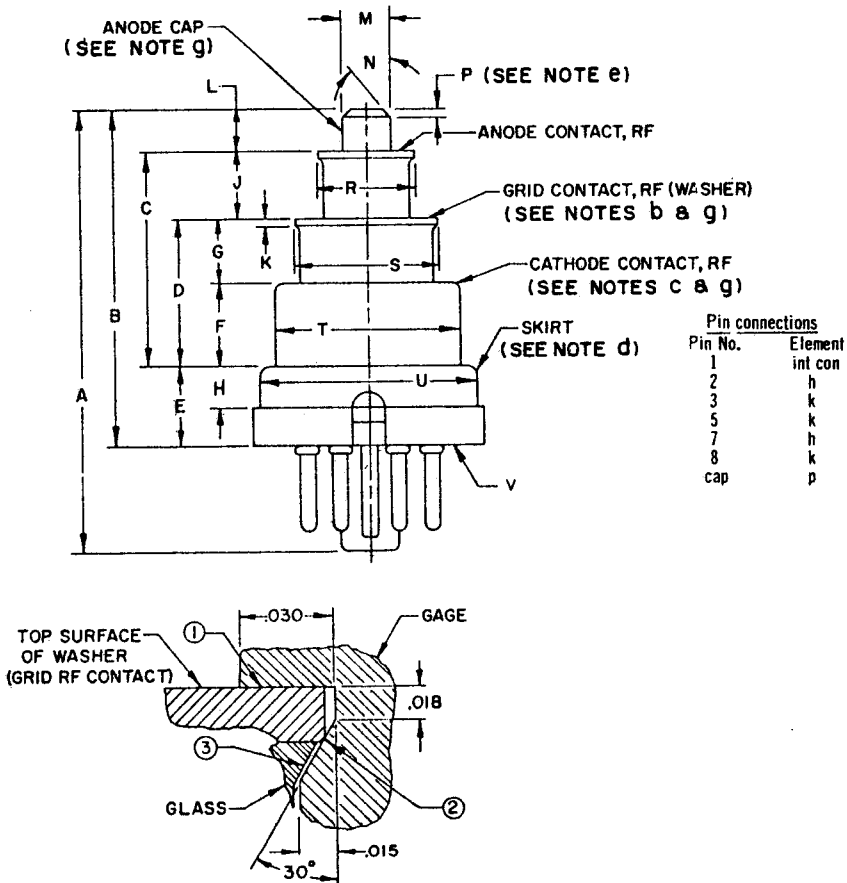
## Review activities:

Army - EL  
Air Force - 11, 99  
DSA - ES

(Project No. 5960-2885)

## User activities:

Army - MU  
Navy - AS, OS, MC, CG



With top surface of washer (grid rf contact) in contact with surface ① of gage and with lower edge of washer (grid rf contact) in contact with surface ② of gage, external glass surface ③ of tube shall not be in contact with gage at any point. Equivalent gaging procedure may be used.

GAGING PROCEDURE, GLASS SURFACE

FIGURE 1. Outline drawing of electron tube type 2C40A.

Ltr	Dimensions in inches with metric equivalents (mm) in parentheses		Notes
	Minimum	Maximum	
Quality conformance inspection, part 2			
A		2.562 (65.07)	a
B		1.973 (50.11)	
C	1.220 (30.99)	1.260 (32.00)	
D	.850 (21.59)	.880 (22.35)	
E	.395 (10.03)	.455 (11.56)	a
F	.475 (12.07)	.505 (12.83)	
G	.360 (9.14)	.390 (9.91)	
H	.180 (4.57)	.210 (5.33)	a
J	.360 (9.14)	.390 (9.91)	a
K	.030 ( .76)	.035 ( .89)	a
L	.242 (6.15)	.258 (6.55)	
M	.248 (6.30)	.252 (6.40)	
P	.016 ( .41)	.047 (1.19)	a
R	.557 (14.15)	.567 (14.40)	a
S	.808 (20.52)	.816 (20.73)	
T	1.023 (25.98)	1.039 (26.39)	
U	1.216 (30.89)	1.236 (31.39)	a
V	B6-108		
Reference dimensions			
N	45°		

## Notes:

- These dimensions shall be inspected on 10 tubes a month when in continuous production. Failure of more than one tube to meet tolerances for any dimension shall cause that dimension to become for all lots in process, part of quality conformance inspection, part 2.
- External glass surface of tube shall conform with the detailed requirements of figure 1. Quality conformance inspection, part 2 shall apply.
- Cathode rf contact surface shall be free from welding flash material, quality conformance inspection, part 2 shall apply.
- Limits of dimension U do not apply at points where skirt is crimped to base.
- Radius with limits as specified may be used instead of chamfer.
- External metal surfaces, except base pins, shall be silver plated 30msi, minimum. Quality conformance inspection, part 2, shall apply.
- Eccentricity of contact surfaces shall be as follows. Quality conformance inspection, part 2, shall apply.

<u>Contact surface</u>	<u>TIR maximum</u>	<u>Reference surface</u>
Grid	.016	Anode cap
Cathode, rf	.016	Grid

FIGURE 1. Outline drawing of electron tube type 2C40A.  
Continued.